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BY FACSIMILE

To: Michael A. Band
United States Patent and Trademark Office
Art Unit 1795

Re: Telephone Interview
U.S. patent application no. 10/573,942
Attorney Docket: NAA237

Dear Mr. Band

Thank you for granting a telephone interview with your SPE for Wednesday, August 25, 2010 at 11:00 am EDT.

During the interview we wish to review the arguments that we submitted in our response to a previous office action. Those arguments are summarized on the following pages.

I will call you at (571) 272-1446 at the scheduled time. Please let me know if this is not correct or if your plans have changed. If needed, you may reach me at (510) 713-0991.

Very truly yours,

David N. Lathrop

SUMMARY OF ARGUMENTS

Claims 1-8 are rejected under 35 U.S.C. § 103 for being unpatentable over U.S. patent application publication no. 2002/0000552 (referred to as "Morimoto") in view of U.S. patent application publication no. 2004/0137158 (referred to as "Kools").

With regard to independent claim 1, the most recent Office Action makes four assertions:

(1) Morimoto teaches all that is claimed except for the use of a gas cluster ion beam;

(2) Kools:

  (a) teaches methods using monomer and cluster ion beams,

  (b) "depicts in fig. 6 the cluster ion beam smoothing at an acute angle," and

  (c) "recognizes the equivalency of an Ar monomer beam and Ar cluster beam in the field of angled smoothing of a substrate";

(3) it would have been obvious to replace the Ar monomer beam of Morimoto with the Ar cluster ion beam of Kools because:

  (a) "it is merely the selection of functionally equivalent angled smoothing recognized in the art "

  (b) "one of ordinary skill would have a reasonable expectation of success in doing so"; and

(4) "... since both [Morimoto and Kools] teach methods (i.e., monomer beam and cluster ion beam) for angled smoothing of a substrate, it would have been obvious ... to substitute one method for the other to achieve the smoothing of a substrate surface.

In their prior response, the Applicants presented reasons why they disagree with assertions (2), (3) and (4). The following text focuses on assertion (2), which pertains to what is taught in Kools.

The Applicants agree that Kools discloses the use of monomer ion beams and GCIB for smoothing but they disagree that Kools discloses the use of GCIB at acute angles and they disagree that Kools (or any other known prior art) teaches that these two beams are equivalent.

gas cluster ion beams at acute angles

Referring to paragraphs [0061] to [0066], Kools discloses the use of a monomer ion beam in which the energy of the beam and the angle of incidence onto a substrate to polish or smooth may be set within a range of angles.

Referring to paragraphs [0067] to [0069], Kools discloses the user of a gas cluster ion beam (GCIB) in which the energy of the beam may be adjusted but only one angle of incidence is disclosed, which is perpendicular or normal to the substrate (see last sentence of paragraph [0069]).

Contrary to what is asserted in the Office Action, Kools does not disclose cluster ion beam smoothing at an acute angle. The Office Action refers to Fig. 6 for support of this assertion but Kools indicates Fig. 6 illustrates "one embodiment of the smoothing step" (emphasis added) in which "particles 208" bombard a surface. In view of what is disclosed in the specification, the angle illustrated in Fig. 6 for the one embodiment can pertain only to a monomer ion beam.

This conclusion is consistent with other prior art that is cited in Kools and was disclosed previously in Information Disclosure Statements. Referring to paragraph [0068], Kools cites U.S. patent 5,459,326 to Yamada et al. and U.S. patent 6,375,790 to Fenner et al. Referring to cols. 3 and 4 in Fenner et al.:

> "… At that focus point on the beam axis the workpiece target 104 is located, it being perpendicular to the beam." (col. 3 lns. 49-51)
>
> "… an optical method of measurement is utilized, since it can do so while working well away from the normal incidence angle that the cluster beam requires …." (col. 4 lns. 20-23, emphasis added)

As may be seen, Fenner expressly teaches a normal incidence and further indicates it is required.

The Yamada patent also teaches using a normal incidence. The inventor expounds upon this teaching in a paper previously disclosed by the Applicants in an Information Disclosure Statement. This paper is discussed below.

gas cluster ion beams and monomer ion beams are not equivalent

The Office Action indicates Kools teaches that monomer ion beams and GCIB are equivalents merely because Kools specifically states that a smoothing step can use either a noble gas monomer ion beam or alternatively a GCIB.

The Applicants respectfully disagree that Kools teaches that these two types of ion beams are equivalents and they disagree that these two types of ion beams are in fact equivalents. Both areas of disagreement are discussed in the following paragraphs.

First, Kools does not disclose or suggest that monomer ion beams and GCIB are equivalent. Kools discloses the use of monomer ion beams and GCIB in two different embodiments with each embodiment having has its own unique requirements (see [0062] and [0068]). This does not imply equivalence. For example, a person could use either a bulldozer or a case of dynamite to demolish a house. The fact that these two approaches are alternatives to one another is not sufficient by itself to show they are equivalent. This example shows that widely different non-equivalent techniques can be used for the same purpose.

Second, the prior art teaches that these two types of beams are not equivalent.

Referring to paragraph [0069], Kools cites the paper "Substrate smoothing using gas cluster ion beam processing," Journal of Electronic Materials, vol. 30, no. 7, Jul 2001, p.829 by Allen et al. (A copy of the text from this paper may be obtained from:

http://findarticles.com/p/articles/mi_qa3776/is_200107/ai_n8964633.

Referring to the first paragraph under the heading "Gas Cluster Formation," Allen et al. state the following:

> "The impact morphology and kinetics of an atomic or molecular cluster ion impinging on the surface is quite different from that of an ion implanted atom into a target. …." (emphasis added)

This statement is consistent with statements made in Yamada, "Cluster ion beam process technology – 20 years of R&D history," Nuclear Instruments and Methods in Physics Research, B257, 2007, pp.632-638, which was disclosed previously in an Information Disclosure Statement. This paper states the following:

> "The interaction effects are very different for monomer ions, molecular ions and very large clusters. …."
>
> "An important characteristic of large gas cluster ion bombardment is an effect known as lateral sputtering. Angular distributions of surface atoms ejected by cluster ions are considerably different from the distributions produced by monomer ions. …."
>
> * * *
>
> "Lateral sputtering produces surface smoothing behavior which does not occur with monomer ions. …." (pp. 635-636, emphasis added)

The Applicants believe these statements are sufficient to show monomer ion beams and gas cluster ion beams are not functionally equivalent.

We now briefly comment on assertion (3) that "one of ordinary skill would have a reasonable expectation of success in [substituting a GCIB for a monomer ion beam]."

Referring to the graphs and text on page 636, the Yamada paper shows surface smoothing for gas cluster ion beams decreases (roughness increases) as the incidence angle increases from zero degrees (normal incidence) to sixty degrees. In contrast to this, Yamada teaches that surface roughness increases for monomer ion beams with normal incidence.

Given this teaching from the prior art, the Applicants submit that a skilled person would not expect the smoothing effect to increase for acute angles (as measured from the surface). The skilled person would have had the opposite expectation.